REMARKS

The present response is to the Office Action mailed in the above-referenced case on November 18, 2003. Claims 1-24 are presented below for examination. Claims 1-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Borkenhagen (U.S. 6,076,157), hereinafter Borkenhagen, and Kalafatis (U.S. 6,535,905), hereinafter Kalafatis.

Applicant has again carefully studied the prior art references cited and applied by the Examiner, and the Examiner's rejections and statements in the instant Office Action. In response applicant herein provides further argument to more particularly point out and distinctly claim the subject matter of applicant's claims regarded as patentable, and to establish that the combined art presented by the Examiner in the instant Office Action clearly does not teach the architecture of applicant's invention as taught and claimed, which is required for practicing applicant's invention, and further that the inventions of the combined references relied upon by the Examiner do not obviate all of the limitations of applicant's claims. Applicant points out and argues the key limitations in applicant's claims, which still appear to have be misunderstood by the Examiner in his rejections and statements. Applicant further judicially amends the language of the base claims in support of applicant's above argument, to more specifically recite the multi-streaming processor.

Regarding claim 1, the Examiner has stated in the instant Office Action that Borkenhagen taught a system substantially as claimed including a data-processing system comprising a multi-streaming processor, means and method for selecting which stream to fetch instructions, and further, that Borkenhagen taught the use of a fetch algorithm that included switching threads, but did not expressly detail that the predictor for switching threads or streams included whether a branch was taken.

The Examiner relies on the reference of Kalafatis for teaching the

deficiency in Borkenhagen, stating that Kalafatis specifically taught a switch on branch logic that use a scheme or algorithm that determined (not predicted) whether to switch threads depending on whether a branch was predicted as taken. The Examiner further stated that it would have been obvious to combine the teachings of Kalafatis with those of Borkenhagen as both are directed to the problems of efficient switching between instruction streams or threads.

Applicant respectfully disagrees with the Examiner's interpretation of the teachings of the combined art, and argues that it's certainly would not have been obvious at the time of the invention to apply any of the teachings of Kalafatis to those of Borkenhagen to produce applicant's claimed invention, because the combined art teaches an alternative invention for solving a different problem from that solved by applicant's invention, and further, that the architectural differences between the teachings of the combined art, and that taught in applicant's invention, prevents the invention of the combined art from practicing applicant's invention as taught and claimed.

Firstly, it appears to applicant, based on the Examiner's statements in Detailed Action section of the instant Office Action, that the Examiner does not appreciate the clear distinction between streams and threads in a multistreaming processor. The Examiner has stated that Borkenhagen taught applicant's invention substantially as claimed including a multistreaming processor, and that while Borkenhagen taught the use of a fetch algorithm that included switching threads (not streams), Borkenhagen did not expressly detail that the predictor for switching threads or streams included whether a branch was taken.

Applicant respectfully points out to the Examiner that, even if Kalafatis did teach a predicting scheme such as indicated by the Examiner, the Examiner's interpretation that it would have been obvious to apply the teaching of Kalafatis for use in a processor which only processes multiple threads, not comprising multiple hardware streams, which is the processor taught in both references, is clearly incorrect. Neither reference teaches the environment required for practicing applicant's invention, i.e., a multi-streaming processor, because

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applicant's invention teaches wherein the prediction by the branch predictor is used by the fetch algorithm in determining from which stream (not thread) from which to fetch instructions.

Specifically, a stream in reference to a processing system is defined as a hardware capability of the processor for supporting and processing an instruction thread. A thread is the actual software running within a stream. For example, a multi-streaming processor implemented as a CPU for operating a desktop computer may simultaneously process threads from two or more applications, such as a word processing program and an object-oriented drawing program. As another example, a multi-streaming-capable processor may operate a machine without regular human direction, such as a router in a packet switched network. In a router, for example, there may be one or more threads for processing and forwarding data packets on the network, another for quality-of-service (QoS) negotiation with other routers and servers connected to the network and another for maintaining routing tables and the like. The maximum capability of any multi-streaming processor to process multiple concurrent threads remains fixed at the number of hardware streams the processor supports. A multi-streaming processor is not necessarily a multithreaded environment, as alluded to by the Examiner, because a multi-streaming processor may operate a single thread, thereby operating as a single-stream processor with unused streams idle. There are clear distinctions between threads and streams, and applicant therefore strongly argues that the Examiner's combination of the teachings of Borkenhagen and Kalafatis is improper, as Kalafatis teaches nothing whatever to do with a processor having multiple hardware streams supporting multiple data threads, as is now specifically recited in applicant's base claims, and further, clearly does not teach or suggest the capability for practicing the invention in a multi-streaming environment.

The Examiner has stated that Borkenhagen taught applicant's invention substantially as claimed, with the exception of expressly detailing that the predictor for switching threads or streams included whether a branch was taken (i.e., based in the prediction for switching threads on past history). Applicant

argues, however, that not only does Borkenhagen fail to disclose a thread switching prediction based on whether a branch was taken, Borkenhagen simply fails to teach any prediction at all for forecasting whether a branch alternative of a branch instruction will be taken. Borkenhagen simply teaches determining switching between threads based on current thread states and activity compared against preset thresholds. There is no teaching or suggestion Borkenhagen of any type of prediction whatsoever, based on whether a branch was taken, or any other type of branch, or any other such history data for that matter.

Applicant further argues that the reference of Kalafatis also fails to explicitly teach or suggest applicant's claimed limitation of a fetch algorithm for selecting from which stream fetch instructions, and a branch predictor for forecasting whether a branch alternative of a branch instructions will be taken, wherein the prediction by the branch predictor is used by the fetch algorithm in determining from which stream to fetch, the invention practiced in a processor having multiple hardware streams supporting multiple data threads, as taught and now claimed in applicant's invention. The invention of Kalafatis teaches in a multi-threaded (not multi-streaming) processor, a thread-switching scheme which, on encountering a branch instruction that is predicted to be TAKEN within the instruction stream of a specific software thread, performing a switch between threads. Applicant does not see how this teaching reads on the limitations of applicant's base claims, specifically reciting a branch predictor for forecasting whether a branch alternative of a branch instructions will be taken. Applicant argues that Kalafatis, as in the reference of Borkenhagen, therefore also teaches an alternative invention for solving an alternative problem from that which is solved by applicant's invention as taught and claimed

Applicant's claim 1 as judicially amended to more specifically recite the multistream processor, and as argued above by applicant, is therefore clearly and unarguably patentable over the combined art. Independent claims 6, 11, 16, 21 and 23 each now more specifically recite the multi-streaming processor and method for a multi-streaming processor, in accordance with the limitations recited

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in claim 1. Independent claims 6, 11, 16, 21 and 23 are therefore also clearly patentable over the combined art, in view of applicant's arguments presented above on behalf of claim 1. Depending claims 2-5, 7-10, 12-15, 17-20, 22 and 24 are then patentable on their own merits or at least as depended from a patentable claim.

It is therefore respectfully requested that this application be reconsidered, the claims be allowed, and that this case be passed quickly to issue. If there are any time extensions needed beyond any extension specifically requested with this amendment, such extension of time is hereby requested. If there are any fees due beyond any fees paid with this amendment, authorization is given to deduct such fees from deposit account 50-0534.

Respectfully submitted
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